PhytoKeys 132: 91–98 (2019)
doi: 10.3897/phytokeys.132.35428
http://phytokeys.pensoft.net

RESEARCH ARTICLE

A peer-reviewed open-access journal
PhytoKeys
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Sedum ichangensis, a new species of Crassulaceae from Hubei, China

Yu-Bing Wang[1], Xing-Jun Xiong[2]

1 *Key Laboratory of Three Gorges Regional Plant Genetics & Germplasm Enhancement (CTGU)/Biotechnology Research Center, China Three Gorges University, Yichang, 443002, China* **2** *Changyang Hospital of Traditional Chinese Medicine, Changyang, 443500, China*

Corresponding author: *Yu-Bing Wang* (tomswfc1977@163.com)

Academic editor: *Yasen Mutafchiev* | Received 13 April 2019 | Accepted 17 July 2019 | Published 2 October 2019

Citation: Wang Y-B, Xiong X-J (2019) *Sedum ichangensis*, a new species of Crassulaceae from Hubei, China. PhytoKeys 132: 91–98. https://doi.org/10.3897/phytokeys.132.35428

Abstract

Sedum ichangensis **sp. nov.**, from Yichang, Hubei province, central China, is described and illustrated. The new species is similar to *S. elatinoides* and *S. rosthornianum* in its leaf and carpel morphology and differs in its creeping stems and solitary flowers. The conservation status of *S. ichangensis* was assessed as Endangered according to the IUCN Red List criteria.

Keywords

Crassulaceae, Flora of China, Flora of Hubei, new species, *Sedum* sect. *Filipes*

Introduction

Sedum Linnaeus (1753: 430), the largest genus in the family Crassulaceae with about 430 species, is particularly diverse in East Asia, the Mediterranean and North America (Linnaeus 1753; 't Hart and Bleij 2003; Thiede and Eggli 2007). *Sedum* can easily be distinguished by its usually alternate leaves, sessile carpels with slightly connate at the base, separate, mostly yellow or white petals and stamens with two whorls (Thiede and Eggli 2007); however, molecular studies have revealed that *Sedum* is a highly polyphyletic group (Nikulin et al. 2016) which may be due to the high morphological plasticity and variability within the genus (Carrillo-Reyes et al. 2009). In China, 121 species were recorded in the "Flora of China" (Fu and Ohba 2001). Since 2001, six new species have been described, namely *S. hoi* X. F. Jin & B. Y. Ding (2005: 381),

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S. spiralifolium D.Q. Wang, D.M. Xie & L Q. Huang (2014: 117), *S. plumbizincicola* X.H. Guo & S.B. Zhou ex L.H. Wu (2013: 492), *S. fanjingshanensis* C. D. Yang & X. Y. Wang (2012: 389), *S. kuntsunianum* X. F. Jin, S. H. Jin & B. Y. Ding (2013: 34) and *S. peltatum* M. L. Chen & X. H. Cao (2017: 847).

According to the recent taxonomic treatment of Fu and Ohba (2001), the species of *Sedum* in China are divided into three sections, viz. *Sedum* sect. *Sedum*, sect. *Oreades* (Fröderström) K.T. Fu and sect. *Filipes* (Fröderström) K.T. Fu. The section *Sedum* is distinct from both sections *Oreades* and *Filipes* in its adaxially gibbous carpels and follicles (vs. carpels and follicles not gibbous); while the sect. *Oreades* differs from the sect. *Filipes* in its spurred (vs. spurless) leaf base and petals that are mainly yellow (vs. mainly white or reddish-purple) (Fu and Ohba 2001).

An unknown *Sedum* species, belonging to the sect. *Filipes,* was discovered in Hubei Province, Central China. The species is described as new to science in this study.

Material and methods

Three scattered populations of an unknown *Sedum* species were discovered in Yichang city of Hubei Province, Central China in 2014. These populations were continuously observed over 2 years. Fresh specimens collected from these populations were morphologically studied and illustrated. The distribution map was constructed with Arcgis 10.2, using data provided on the specimen labels.

Specimens of the morphologically similar species *Sedum elatinoides* Franchet (1883: 11) and *S. rosthornianum* Diels (1900: 361) were collected from Hubei province for comparison. Specimens of *Sedum* sect. *Filipes* deposited at PE, HIB, WH and CCAU were largely checked, based on the relevant literature (Fu and Ohba 2001, Fu 2001). Furthermore, digital images of type specimens archived at the JSTOR Global Plants website (http://plants.jstor.org) were examined.

Taxonomy

***Sedum ichangensis* Y. B. Wang, sp. nov.**
urn:lsid:ipni.org:names:60479381-2
Figures 1, 2

Diagnosis. *Sedum ichangensis* has papillate carpels and appears to be morphologically similar to *S. elatinoides* and *S. rosthornianum*. It can be distinguished from *S. elatinoides* by its perennial habit (vs. annual) and solitary flower (vs. flowers in cymes) and from *S. rosthornianum* in its entire leaf margins (vs. leaf margins dentate), its branched stems (vs. stems simple) and its solitary flowers (vs. flowers in paniculiform cymes). (Table 1, Fig. 1, 2).

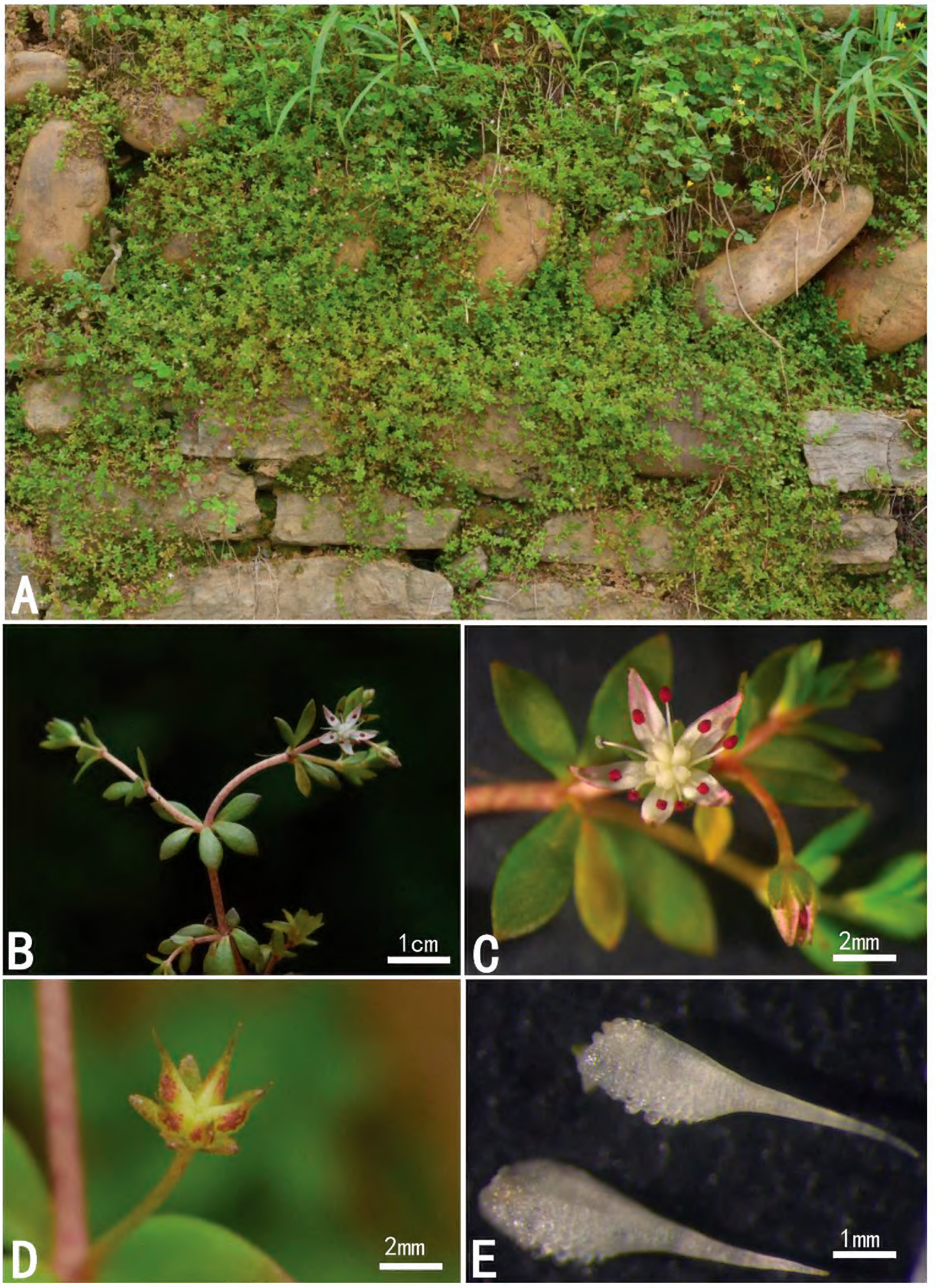

Figure 1. *Sedum ichangensis* Y. B. Wang from type locality **A** habitat **B** flowering stems **C** flower **D** unripe follicles **E** carpels with style.

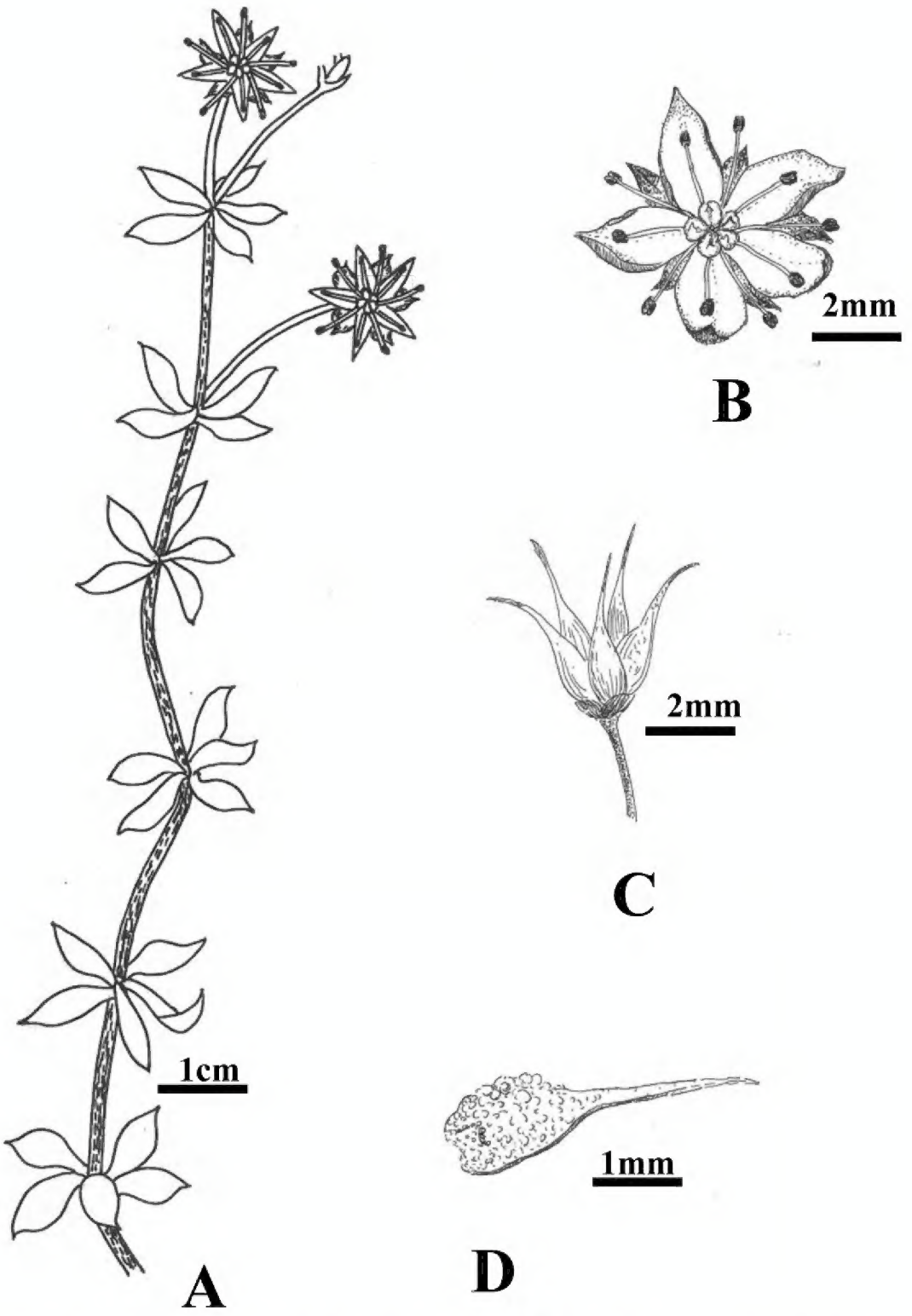

Figure 2. *Sedum ichangensis* Y. B. Wang, sp. nov. **A** habit **B** flower **C** carpels **D** single carpel.

Type. CHINA: Hubei Province, Yichang city, Changyang County, Longzhouping Town, on rocks, alt. 130 m. 30°28'N, 111°11'E, 19 Jul 2017, ycmy032 (holotype, CTGU!; isotypes HIB!, and PE!).

Description. Perennial herbs. Roots fibrous. Stems procumbent, divaricately branched, 1–2 mm in diameter, up to 35 cm long, with scattered reddish dots. Leaves 4–6-verticillate, entire, sessile, narrowly ellipsoid, 5–12 × 1.5–2.5 mm, base attenuate, apex acute. Flowers 5-merous, solitary in the axils of upper leaves, 5–8 mm in diameter. Pedicel 1.5–2.5 cm long. Sepals 5, lanceolate, 1.5–2 mm long, apex acute. Petals 5, white, pinkish towards the apex, lanceolate, 4–5 × 1–2 mm, apex acute. Stamens 10, in 2 whorls, slightly shorter than the petals, antesepalous ones ca. 4 mm long, antepetalous ones ca. 3 mm long, inserted ca. 1 mm above the petal base, filaments

white, 1.6–2.4 mm long, anthers ca. 0.4 mm long, reddish. Nectar scales spatulate, ca. 0.4 mm long. Carpels 5, white, suberect, adaxially minutely papillate, broadly ovoid, ca. 2 mm long, base united for ca. 0.2 mm, styles ca. 1.5 mm long. Follicles divergent, 0.8–1.1 mm long, with scattered reddish dots, seeds numerous, brown, ca. 0.5–1 mm long, papillate.

Phenology. Flowering from early May to July, fruiting from August to October.

Distribution and habitat. *Sedum ichangensis* is known from Longzhouping town of Changyang County, Gufu town of Xingshan County and Muyang River of Yiling County in Yichang City of western Hubei Province, central China (Fig. 3). It grows on rocks of roadsides, especially in fissures filled with soil, at an elevation of ca. 100–280 m.

Chinese name. Yi-chang-jing-tian (宜昌景天).

Etymology. The specific epithet of this new species is dedicated to the Yichang city.

Taxonomic notes. *Sedum ichangensis* belongs to *Sedum* sect. *Filipes* on account of its carpels adaxially not gibbous, its spurless leaf base and its white flowers (Fu and Ohba 2001). *Sedum ichangensis* is a species easily identifiable by its floral, stem and leaf features. The new species resembles *S. elatinoides* in the leaf characters, as well as the structure of the flowers. However, *S. ichangensis* differs from *S. elatinoides* in its perennial habit with branched stems and its solitary flowers. *Sedum ichangensis* differs from *S. rosthornianum* in its much branched, decumbent stems, entire leaf margins and its solitary flowers. Here, we provide photographs (Fig. 1), line drawings (Fig. 2) and a detailed morphological comparison (Table 1), as well as a key to the species of *Sedum* sect. *Filipes* in China to facilitate its identification.

Additional specimens examined (paratypes). CHINA. Hubei Province: Xingshan County, Gufu town, 200 m alt., 31°20'N, 110°45'E, 15 May 2017, YB Wang ycmy022 (CTGU), same loc. XJ Xiong XXJ024 (CTGU); Yiling County, Muyang River, 280 m alt., 30°44'N, 111°02'E, 3 August 2017, YB Wang ycmy139 (CTGU).

Conservation status. Based on field investigations, *S. ichangensis* occurs only in three scattered areas. The total area of occupancy is less than 500 km^2; each population possesses no more than 300 mature individuals. It prefers habitats on rocks along roads. Human activities are impairing its populations severely. The type population, which grew close to a road, was seriously impacted in its survival due to herbicide spraying in 2018. Based on currently available information, the conservation status of this species is categorised as Endangered [EN] following the IUCN Categories and Criteria (IUCN 2017).

Table 1. Morphological comparison between *Sedum ichangensis* and related species.

Item	*Sedum ichangensis*	*Sedum elatinoides*	*Sedum rosthornianum*
Habit	perennial	annual	perennial
Stem	prostrate	erect	erect
Phyllotaxis	4–6-verticillate	3–6-verticillate	opposite or 3- or 4-verticillate
Leaf blade	narrowly ellipsoid, entire	narrowly oblanceolate, entire	rhombic-oblong, dentate
Inflorescence	solitary flower	paniculiform or corymbiform cyme	paniculiform cyme
Petal	white, pinkish toward the apex	white	white

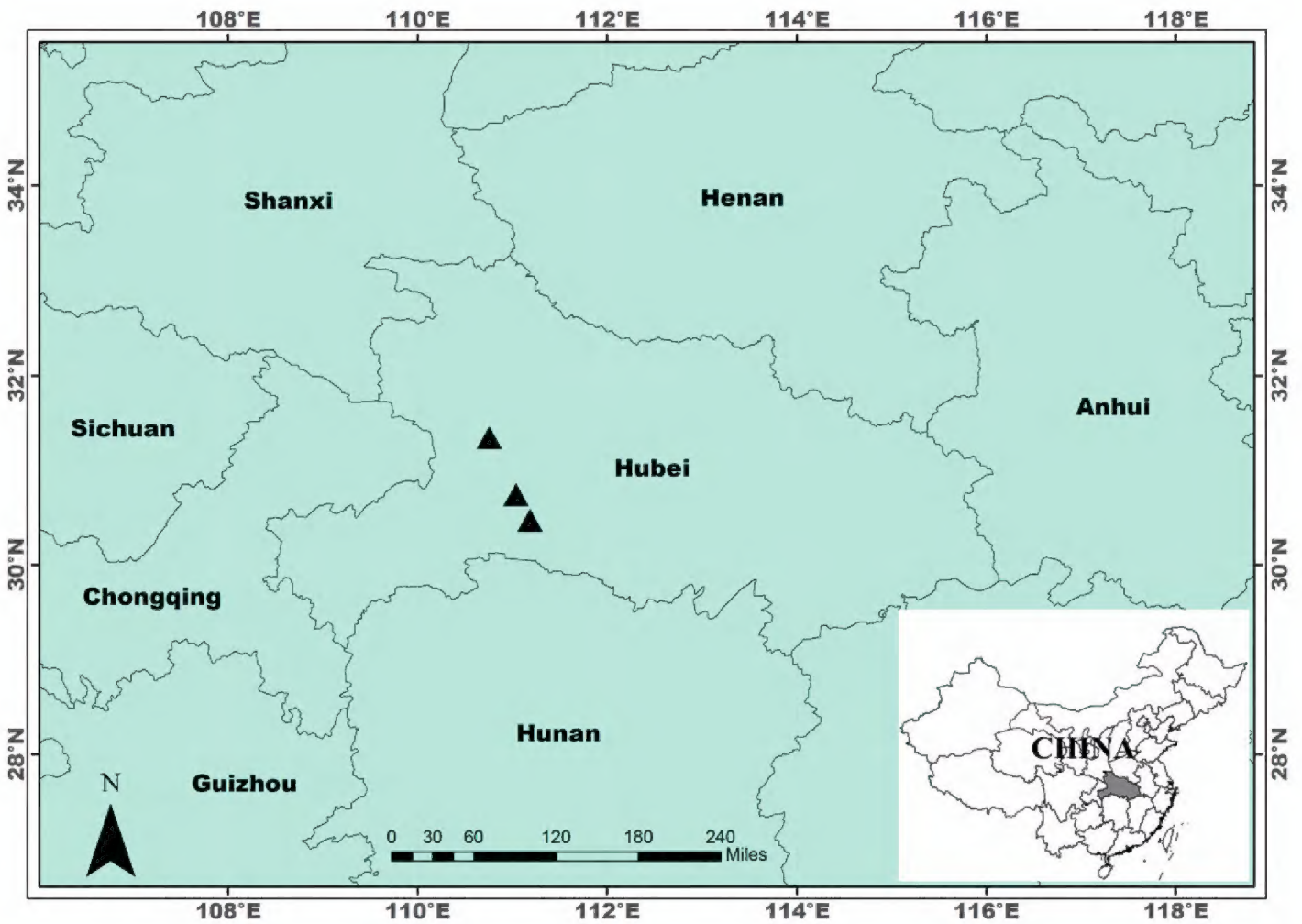

Figure 3. Distribution of *Sedum ichangensis* in Hubei province, central China. The three known localities are indicated with triangles.

Key to the species of *Sedum* sect. *Filipes* in China (adapted from Fu and Ohba 2001):

1 Plants perennial, fasciculate; stamens in 1 series ..... ***S. correptum***
– Plants annual or biennial, rarely perennial, solitary or tufted; stamens in 2 series ... **2**
2 Plants glandular hairy **3**
– Plants glabrous. **4**
3 Plants annual; stems soft; leaves 2–4 × 1.4–2.5 cm ..... ***S. drymarioides***
– Plants biennial; stems ± woody at base; leaves 0.7–1.5 × 0.7–0.9 cm ..... ***S. stellariifolium***
4 Carpels minutely papillate **5**
– Carpels smooth 7
5 Stems simple, erect; leaf margin dentate ..... ***S. rosthornianum***
– Stems many branched, decumbent; leaf margin entire **6**
6 Plants annual; stems erect, flowers in cymes ..... ***S. elatinoides***
– Plants perennial, stems creeping, flowers solitary ..... ***S. ichangensis***
7 Carpels 3 ..... ***S. bonnieri***
– Carpels 5 ..... **8**
8 Petals reddish-purple; flowering stems branched, ca. 20 cm ..... ***S. filipes***
– Petals white; flowering stems simple, ca. 10 cm ..... ***S. majus***

Acknowledgements

We would like to thank Associate Professor Qiao Li for her excellent illustrations of *S. ichangensis*. Thanks are also due to the reviewers for their useful suggestions. This study was supported by the Special funds for science and technology innovation of Hubei (grant no. 2018ACA132).

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